National Park Service
U.S. Department of the Interior

National Natural Landmarks Program

National Natural Landmarks Program

Supporting Conservation of America's Natural Heritage

Annual Report 2009

Contents

Program Overview

Program Manager Margi Brooks talks with Regional Coordinator Steve Gibbons (Pacific West Region) at the 2009 NNL staff meeting held at the Ghost Ranch NNL near Abiquiu, New Mexico.

History and Purpose

The National Natural Landmarks (NNLP) Program was established in 1962 by the Secretary of the Interior under the authority of the Historic Sites Act of 1935 (16 U.S.C. 461 et seq.) to encourage the preservation of the best remaining examples of the major biotic communities and geologic features composing the nation's natural landscape. The program is managed by the National Park Service (NPS.) It is the only natural areas program of national scope that identifies and recognizes the best examples of biological and geological features in both public and private ownership.

National Park Service Director Conrad Wirth articulated the purpose of the program in a memorandum to Secretary Stewart Udall in 1962: "The purpose of the program is to identify, direct attention to, and encourage preservation of... properties, in whatever ownership, as may be found to be valuable as scientific landmarks for educational or research purposes." Director Wirth also noted that "These natural geological and ecological exhibits or sites worthy of national landmark status are important for the illustration of the basic geological and ecological story of America."

Sites considered for possible NNL designation are identified primarily through inventory studies conducted by contractors under NPS direction. Recommendations received from non-NPS sources can be considered in relationship to those in the above-mentioned inventories. Highly recommended areas are then inspected in the field and evaluated comparatively by expert natural scientists with respect to significance criteria. Areas judged the best examples of ecological or geological features are nominated to the Secretary of the Interior for designation as NNLs and, if designated, are listed on the National Registry of Natural Landmarks. There are currently 586 sites designated in 48 states, 3 territories, and the Commonwealth of Puerto Rico.

Natural landmark designation is not a land withdrawal, does not change the ownership of a site, and does not dictate activity. The Secretary employs the designation of nationally significant natural areas to encourage their voluntary preservation, their well-informed management, and their consideration in public and private planning efforts through public recognition. Federal agencies should consider the unique properties of landmarks in National Environmental Policy Act (NEPA) compliance; there may also be state or local planning or land use implications.

Funding and Staffing

Judy Alderson (Alaska Region,) Margi Brooks, and Heather Germaine (Intermountain Region)

The National Natural Landmarks Program is funded with Natural Recreation and Preservation (NR&P) funds. Authorized funding in 2009 was $541,000. Seventy-seven percent of these funds were distributed to NPS Regional Offices to support the seven regional NNLP coordinators who monitor conditions at NNLs, provide technical support to NNL owners and managers, and oversee the evaluation process of potential NNLs. In addition, this funding supports one service-wide program manager whose duties include overall program policy and direction, budget, staff oversight, and production of the annual report.

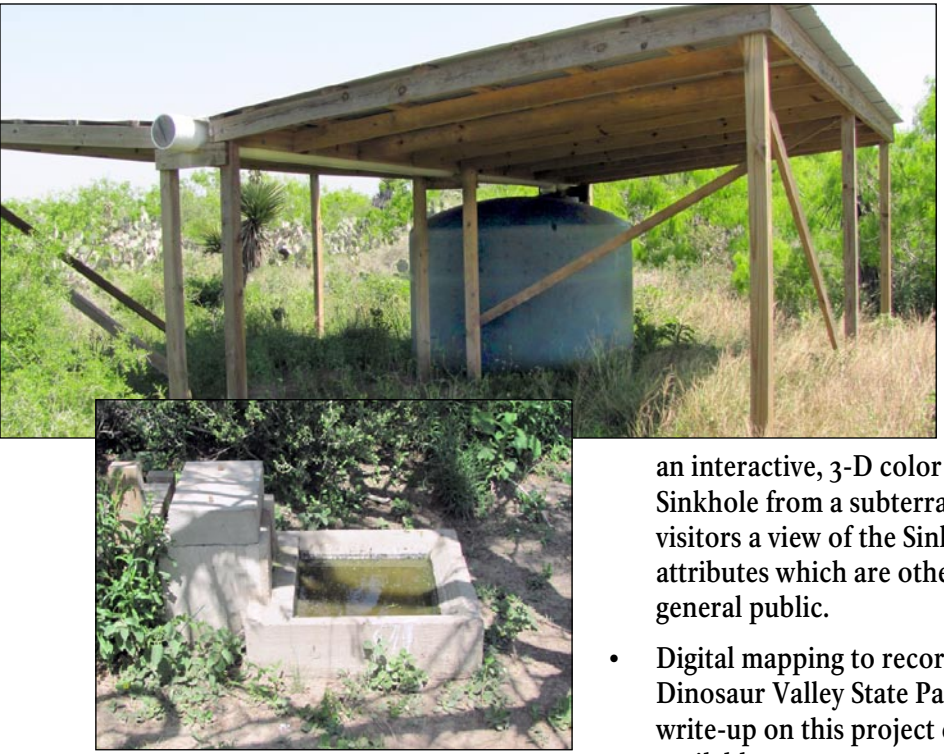
The NNL Program is authorized to accept monetary and in-kind donations. One donation of forty dollars was received during 2009, and royalty payments of approximately eleven thousand dollars were received by the NNL Program in the Pacific West Region.

2009 Projects

Completed Projects

Staff projects

- Sixth annual photo contest
- 2010 NNL Calendar, which showcases the winning photos from the photo contest
- Program poster on display at the George Wright Society meeting illustrating projects and grants obtained through the Challenge Cost Share Program
- Revised and updated proposal guidelines and template for suggesting a potential NNL
- Revised draft program regulations, which are currently under review and revision
- Revised and updated Registry of Natural Landmarks, June 2009



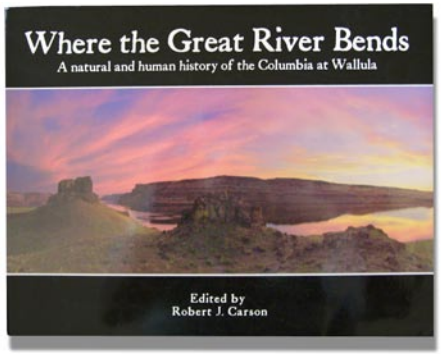
Water catchments and drinkers constructed at the Bayside Resaca NNL in Texas

Challenge Cost Share funded projects

- Completion of supplemental water catchments to benefit endangered ocelots and other wildlife in and around the Bayside Resaca NNL within the Laguna Atascosa National Wildlife Refuge, Los Fresnos, Texas. This project helps to meet the fresh water needs of wildlife species located in and around this NNL and raise public awareness of the NNL and its resources.
- Interpretive exhibits and video station for Devil's Sinkhole NNL in Rocksprings, Texas. The video station houses a computer-based media that will showcase an interactive, 3-D color computer model of the entire Devil's Sinkhole from a subterranean perspective. This technology offers visitors a view of the Sinkhole's remarkable size and uniqueness; attributes which are otherwise difficult to communicate to the general public.
- Digital mapping to record and interpret dinosaur trackways at Dinosaur Valley State Park NNL in Glenrose, Texas. A complete write-up on this project can be found in the NNLP brochure available at: www.nature.nps.gov/nnl

Interpretive exhibits at the Devil's Sinkhole visitor center in Texas

Significant headway was made in 2009 in treating invasive plants at Red Rock Lakes National Wildlife Refuge.



Sales of the book *Where the Great River Bends: a Natural and Human History of the Columbia at Wallula* are strong and continue to benefit the NNL Program.

- Mapping and treatment of invasive plant species on 500 acres within the Red Rock Lakes NNL, a National Wildlife Refuge headquartered in Lima, Montana, and on an additional 800 acres of land within the valley surrounding the NNL.
- Additional funds for the ongoing "Hands on the Land" program at the Fish Slough NNL in Inyo and Mono Counties, California. This program includes a field and classroom handbook for teachers and docents, field trips, training for docents to work with students, classroom science kits, and teacher training workshops.
- Dam removal and restoration of stream flow at Fish Slough NNL, located in Inyo and Mono Counties, California.

Continuing Projects

Challenge Cost Share-funded projects

- Continued receipt of royalties from sales of the book *Where the Great River Bends: a Natural and Human History of the Columbia at Wallula*. This book explores the history of the region surrounding the Wallula Gap NNL in Washington State. Forty percent of the proceeds from the sale of this book continue to benefit the Pacific West Region's NNL Program.
- "Parks Online Resources for Teachers and Students" (PORTS Program) at Anza-Borrego Desert State Park NNL in southern California. This program connects children who are not able to visit parks due to reduced school budgets and geographic distance to park resources through innovative 'live feeds' via videoconferencing interpretive programs.
- Construction of a new interpretive display at Shark Tooth Hill NNL in Kern County, California, which includes the site's bronze plaque, shark teeth uncovered at the site, and professionally drafted geologic and paleontological maps depicting the area's geologic history. The display also contains geologic handouts and brochures for visitors.

New cabinet and NNL plaque for Shark Tooth Hill on display at Bakersfield College

New Projects

Three new Challenge Cost Share projects were funded in 2009, although they were inadvertently written up in the 2008 annual report and appear this year as completed or ongoing projects: the PORTS program at Anza-Borrego Desert State Park, the Interpretive Displays at Shark Tooth Hill, and funding for "Hands on the Land" at the Fish Slough NNL.

Progress Toward New Landmark Designations

Sixteen sites are currently being evaluated by qualified scientists to determine if they meet the criteria for NNL designation. These evaluations will be peer reviewed and the public will be invited to comment on the proposed designations prior to review by the National Park Service Advisory Board (NPSAB) and consideration by the Secretary. No reviews or opportunity for comment occurred in 2009 due to the fact that the NPSAB was awaiting reauthorization and members had not yet been appointed.

New Landmark Designations

Four new National Natural Landmarks were designated by the Secretary of the Interior in January of 2009: Nottingham Park Serpentine Barrens, Cave Without a Name, Big Bone Lick, and the Chazy Fossil Reef.

NOTTINGHAM PARK SERPENTINE BARRENS

Chester County, Pennsylvania
Ownership: County

Nottingham Park Serpentine Barrens support unique serpentine grasslands, pitch pine, and open savanna communities that are especially adapted to the shallow and highly metallic soils and are maintained by frequent fires and other disturbances. The site contains many rare and endemic species, including one of the northernmost occurrences of fame flower and one of the largest populations in the world of the serpentine aster. This new landmark is located in the southeastern part of the state and is owned by Chester County.

CAVE WITHOUT A NAME

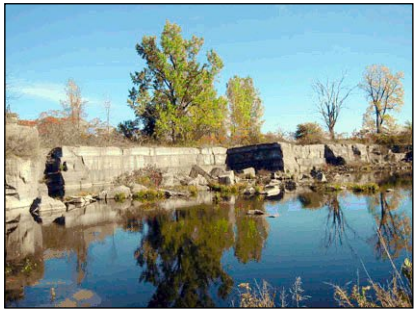
Kendall County, Texas
Ownership: Private

Cave Without a Name in Kendall County, Texas contains exceptional cave formations, a rare and threatened salamander, and significant paleontological deposits. The site is privately owned and open to the public.

BIG BONE LICK

Boone County, Kentucky
Ownership: State

Big Bone Lick in Boone County, Kentucky is unique for its combination of salt springs and associated Late Pleistocene bone beds. Located within Big Bone Lick State Park, southwest of Cincinnati in northern Kentucky, the site's fossils play an important role in the development of scientific thought, especially the concepts of extinction and the relationship of geology and paleontology.



CHAZY FOSSIL REEF

Grand Isle County, Vermont and Clinton County, New York
Ownership: Federal, State and Private

The Chazy Fossil Reef in Grand Isle County, Vermont and Clinton County, New York contains surface exposures of an Ordovician fossil reef. The reef recounts the tropical, marine environment that existed approximately 450 million years ago on the continental shelf of North America. This paleontological treasure represents the oldest known occurrence of a biologically diverse fossil reef in the world, the earliest appearance of fossil coral in a reef environment, and the first documented example of the ecological principle of faunal succession. This new landmark has private, state, and federal owners, and some areas of the site are open to the public.

National Trail and Conservation Area Designations

Grand Coulee

BLM photo

Fort Stanton-Snowy River Cave NCA

The Omnibus Public Land Management Act, signed in March 2009, authorized the creation of the Ice Age Floods National Geological Trail. This National Geological Trail commemorates the giant ice age floods that dramatically shaped the landscape of the Pacific Northwest. The Ice Age Floods National Geological Trail is represented by eight NNLs: Grand Coulee, the Great Gravel Bar of Moses Coulee, Ginkgo Petrified Forest, Drumheller Channels, and the Wallula Gap in Washington; Crown Point and the Willamette Floodplain in Oregon; and Glacial Lake Missoula in Montana. National Geological Trails are designated for their significant natural history and are not part of the National Trails System. The Omnibus Act requires the completion of management and interpretive plans for the trail and also provided authorization for up to 12 million dollars for capital developments such as visitor facilities and interpretive displays.

Drumheller Channels

The 2009 Act also included two new National Conservation Areas (NCA) that encompass NNLs. The Fort Stanton-Snowy River Cave NCA in New Mexico includes the Fort Stanton Cave NNL, and the Beaver Dam Wash NCA in Utah includes the Joshua Tree Natural Area NNL. NCAs are a part of the BLM's National Landscape Conservation System. The NCA designation guides the BLM to "conserve, protect, enhance, and manage these public lands for the benefit and enjoyment of present and future generations." NCA designation provides a layer of protection consistent with the NNL Program's objective to see America's natural heritage conserved. Comprehensive, long-term management plans will be developed for both NCAs.

Wallula Gap

Landmark Events


Garden of the Gods

Centennial Celebrations in Alaska and Colorado

A "Bogoslof Birthday Bash" was held in Unalaska by the U.S. Fish and Wildlife Service in August, 2009 to celebrate the Alaska Maritime National Wildlife Refuge Centennial. The program included speakers, hikes, and a photo display which was later moved to the Dutch Harbor, Alaska airport. This display includes a copy of the proclamation of the Bogoslof Refuge establishment and photos of Bogoslof Island NNL.

The year 2009 marked the 100-year anniversary for Garden of the Gods Park in Colorado Springs, Colorado. A century ago, 480 acres of land were conveyed to the City of Colorado Springs to be kept "free to the public" and "maintained as a public park" for perpetuity. The site was designated a National Natural Landmark in 1971 for its outstanding geological features. The park's celebration included a kick-off event and an evening lecture by Dr. Richard Beidleman titled "Garden of the Gods: A National Natural Landmark."

International Bog Day at Volo Bog Natural Area

International Bog Day started in 1991 and is held annually on the last Sunday in July to celebrate bogs and encourage their conservation. On July 26, Volo Bog NNL, owned by the State of Illinois, kicked off International Bog Day by hosting the 2nd Annual Summer Bog Art Show and Reception, which featured 20 artists, musicians, storytellers, and historians. Volunteers with the Friends of Volo Bog worked with children on crafts and demonstrated the art of woodcarving. Entertainers demonstrated Irish crafts and played drums, and naturalists conducted tours into the bog.

Spruce Hole Bog Receives its First NNL Plaque

An official Department of Interior NNL bronze plaque was presented to the Town of Durham, New Hampshire during the rededication ceremony held at Spruce Hole Bog NNL on November 17, 2009. The sphagnum-heath bog, the last true kettle-hole bog known to exist in southern NH was designated a NNL in 1972. Participants in the ceremony agenda included the town administrator, the chair and others from the Conservation Commission, a professor of geology from the nearby University of New Hampshire, and NPS Northeast Region NNL Program Coordinator.

Representatives from the NPS, PA Dept. of Natural Resources & Conservation, Borough of Marysville, & Susquehanna Water Gaps Coalition with the new bronze NNL plaque. Photo courtesy of SWG Coalition, by C. Dunn.

Rededication of the Susquehanna Water Gaps NNL

Susquehanna Water Gaps, located just north of Harrisburg, Pennsylvania was presented with a replacement bronze plaque during a rededication ceremony held on September 9, 2009. The site was designated a NNL in 1968 for its outstanding viewshed of the geological process resulting in water gaps. The ceremony was organized by the Susquehanna Water Gaps Coalition, and was held at a scenic overlook in Marysville where the new NNL plaque is more securely located. In attendance were community members, Mayor of Marysville, NNL staff, Deputy Secretary-Conservation and Technical Services, and staff from the Pennsylvania Department of Natural Resources and Conservation. In addition to provision of the replacement plaque, the ceremony served to reinvigorate conservation efforts at the site, which is under heavy development pressure.

New Discovery at Mammoth Site of Hot Springs NNL

The Mammoth Site of Hot Springs in South Dakota contains one of the largest concentrations of mammoth remains in the United States. The site also contains bones of other vertebrates including peccary, bear, coyote, camel, and rodents. The site provides volunteer research opportunities through both Elderhostel and Earthwatch. In July 2009, on their last day of excavation, an Earthwatch team began to uncover a 'new' skull in the floor of the bone bed. Uncovering the skull did not increase the known number of mammoths on the site as its tusk had been uncovered and counted before this discovery. This incredible mammoth specimen is now called "Clem", and is situated near "Beauty" and "Napoleon".

Enthusiastic participants at a "dig" held at Mammoth Site of Hot Springs

Junior Paleontologists "Dig" Mammoth Site of Hot Springs NNL

During the summer of 2009 the Mammoth Site of Hot Springs held simulated excavations for "Junior Paleontologists" — children ages 4 to 13. The day started with a 30-minute tour on the site's history, how the fossils were excavated, and why they were preserved, followed by a "dig." The children practiced excavation techniques, which included identifying fossils from prehistoric mammoth and giant, short-faced bear. The fossils (actually replicas) the children uncovered were buried in a special area right next to the site's actual sinkhole excavation. At the end of the day each child received a Fossil ID Booklet and Junior Paleontologist Certificate. Based on the kids' enthusiastic participation, this was a very successful activity.

Discovery Days Celebrated at Cave of the Mounds NNL

Cave of the Mounds, located twenty miles west of Madison, Wisconsin, hosts an annual event called Discovery Days, which was held from August 1-4 in 2009. Cave tours and simulated mining activities enabled children and adults to have fun as they learned about rocks and minerals. Special exhibits and demonstrations held in the Barn Discovery Center provided an in-depth look at cave systems, Wisconsin fossils, and Wisconsin's 'drift-less area', a unique environment left after the most recent glaciation.

Dedication Ceremonies Held for Three New Landmarks

Third graders from New Haven Elementary School attending the dedication for Big Bone Lick in Kentucky

Over 60 people gathered on May 1, 2009 to celebrate the designation of Big Bone Lick in Kentucky as a National Natural Landmark. The dedication ceremony was attended by community members, Kentucky Parks and Recreation staff, commissioners, NNL Program staff, NNL evaluation report scientists, and students from a local elementary school. A third grade class from New Haven Elementary School made Big Bone Lick part of a year-long project. The class met with one of the NNL evaluation scientists to learn more about the park resources, raised money to help get the NNL bronze plaque mounted, donated a tree to be planted at the park, and attended the dedication with their parents and teachers.

An event was held on June 3, 2009 to celebrate the designation of Nottingham Park Serpentine Barrens in Pennsylvania as a National Natural Landmark. Attending the ceremony were community members, Nottingham County Park employees, Chester County commissioners, NPS staff from Washington DC and the Regional Office, and other individuals integral to the conservation of this rare ecosystem. The bronze NNL plaque that will be displayed at the site was unveiled during the event, and attendees were treated to an interpretive hike of the serpentine barrens.

Regional NNL coordinator Carolyn Davis unveils the bronze plaque at the dedication ceremony for the Nottingham Park Serpention Barrens.

NPS staff at the Chazy Fossil Reef NNL dedication

A dedication ceremony to celebrate the designation of Chazy Fossil Reef as a National Natural Landmark was held on September 12, 2009. The dedication was part of a day-long festival with a theme of "Community and Conservation," and was held in conjunction with Isle La Motte's celebration of Teddy Roosevelt Day and the Champlain Quadricentennial. The site is located on islands within Lake Champlain, along the New York and Vermont border. In attendance were community members, municipal, county, state, and federal government officials, the chair of New York's Adirondack Park Agency, and representatives from the Isle La Motte Preservation Trust, Champlain Basin Program, Lake Champlain Land Trust, and municipal and county historical associations.

Landmark Recognition

Serpent Mound Nominated to the World Heritage List

The Ohio Historical Society announced that Serpent Mound State Memorial will be nominated by the United States to the prestigious World Heritage List, which is maintained by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Serpent Mound State Memorial is located within Serpent Mound Cryptoexplosive Structure National Natural Landmark, 31 miles southwest of Chillicothe. Serpent Mound is an internationally known prehistoric site that is more than 1,000 years old. Nearly a quarter of a mile long, the structure is of undetermined origin and has been exposed by differential erosion. The feature is considered to be the largest and finest serpent effigy in the United States. Serpent Mound has been a public park for more than a century and was designated a National Natural Landmark in 1980.

(L to R) David Langford, Executive VP of the Texas Wildlife Association; Peter Holt, Chairman of the Texas Parks and Wildlife Commission; Suzanne Tuttle, Refuge Manager at Fort Worth Nature Center and Refuge; and Carter Smith, Executive Director of Texas Parks and Wildlife Department.

Fort Worth Nature Center and Refuge NNL Receives Stewardship Award

The Lone Star Land Steward Award was bestowed on the resource managers at the Fort Worth Nature Center and Refuge in April 2009 by the Texas Parks and Wildlife Department. The award seeks to "publicize the best examples of sound natural resource management practices and promote long-term conservation of unique natural and cultural resources." The refuge was honored for its ability to maintain and enhance its natural and cultural resources despite the challenges of an urban setting. Through appropriate and effective management practices, the staff transformed the site back to natural conditions, making it an ideal field research area along with providing outstanding recreational opportunities. Also in April, the Cross Timbers Forest at the refuge was chosen by the City of Fort Worth's Forestry Division as a collection of Heritage Trees through the Heritage Tree Campaign. The ancient cross timbers are the primary resource for which this site was given the NNL designation in 1977.

Site Visits and Reports

NNL Program Regional Coordinator Judy Alderson, in green, conducted a site visit in July to the remote McNeil River Bear Sanctuary NNL in Alaska. The trip involved travel by float plane, camping out in cool conditions, and some enjoyable hiking to the bear viewing area.

Reporting Requirements

Prior to the year 2000, Section 8 of the National Park System General Authorities Act of 1970, as amended in 1976, required the Secretary of the Interior to monitor the status and condition of National Natural Landmarks and report on those that are threatened or damaged. To meet this requirement, landmarks were visited and/or owners contacted by telephone, and an annual report on damaged and threatened National Natural Landmarks was prepared by the NPS and submitted to Congress. For over 20 years, this report was distributed to government agencies, NNL owners and managers, conservation organizations, and other interested parties.

There is no longer a Congressional mandate that requires the report on damaged and threatened NNLs be submitted to Congress. Section 3003(a)(1) of the Federal Reports and Elimination and Sunset Act of 1995 eliminated the Section 8 Report, and many others, beginning with the year 2000. The report, as it was formatted in the past, is no longer produced; however, the annual report does contain information on threatened and damaged landmarks.

Site Visits

The NNLP staff maintains a continuing relationship with the owners and managers of designated landmarks through periodic site visits. These visits allow program staff to determine whether the sites have retained the values that initially qualified them for landmark designation (as required in the program regulations) and provide opportunities to collect information to update administrative records. Ideally, landmarks are visited every other year, although recent reductions in the program budget and travel allocations have resulted in landmark visits once every 3 years or less. Threatened or damaged landmarks are generally visited more frequently to assess changing conditions, while landmarks that change little (geologic sites, for example) may be visited less frequently. While field visits are the preferred method, it may be necessary and appropriate to collect information regarding resource condition by telephone, or have an employee from a NPS unit located near the landmark visit and collect information.

One hundred and eighty one (181) landmarks were reported on in 2009, or 31% of total designated sites. This includes both personal and telephone "visits." One hundred two (102) sites were visited in person. This number is significantly less than in years when the NNLP was fully funded – 270 sites, or 49%, were reported on in 2002 – but it is an increase over the number of sites reported on in 2008, which was 170. Site visits are documented by status reports, and copies are sent to landmark owners and placed in the program files. Status reports are generally brief, and include the names and contact information for the people conducting the site visit or providing information, and any pertinent information about condition, anticipated events, projects, damage, etc.

Technical Support and Advocacy


S. Hutchison

MORRISON FOSSIL AREA

Jefferson County, Colorado
Ownership: County

The Morrison Fossil Area was designated a NNL in 1973 for its significance as the first major discovery of giant dinosaur bones in North America. The site is known internationally and has high scientific and educational value. The National Park Service sent a letter to Jefferson County advising them of the national significance of the site, and requesting that this significance be considered in the decision making process regarding reopening a previously closed road located very close to the fossil viewing area.


S. Ringsven

MAUNA KEA

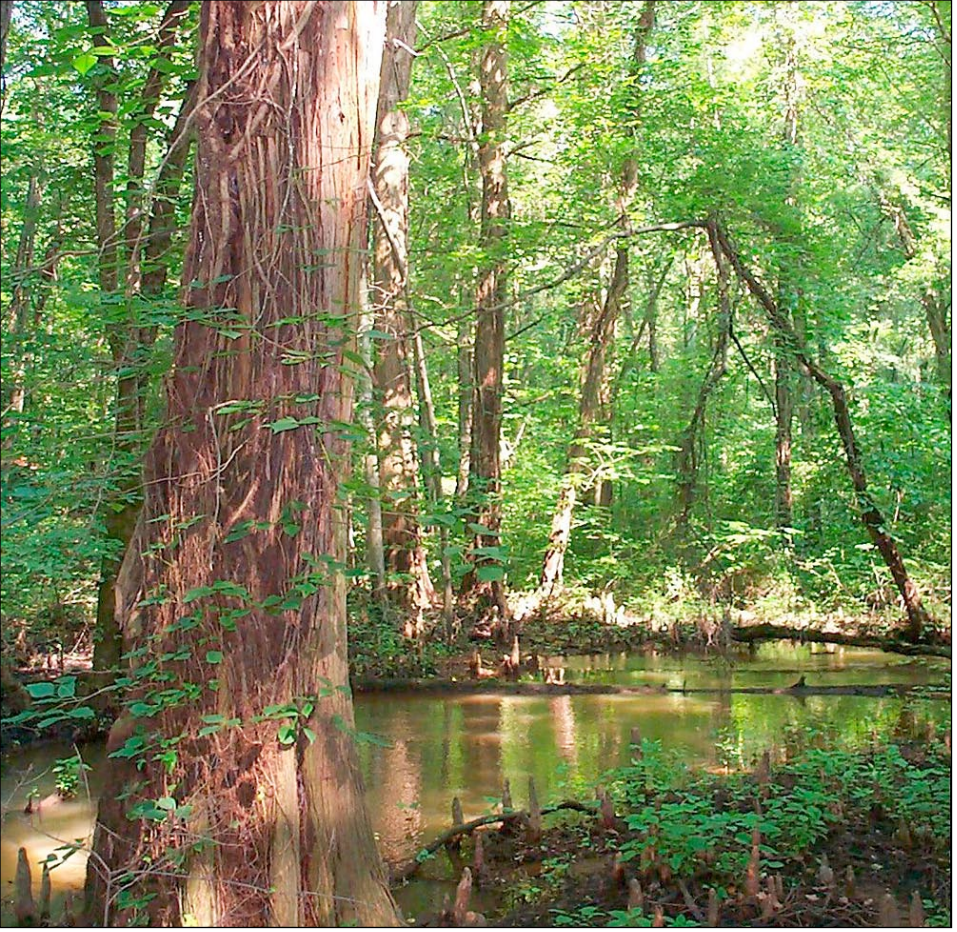
Island of Hawaii
Ownership: State

Mauna Kea was designated a NNL in 1972 as an outstanding example of a shield volcano and for evidence of glaciation above 11,000 feet. The National Park Service provided detailed comments on the proposed construction of the Thirty Meter Telescope Observatory within the upper summit area of the landmark that lies within the 530-acre "Astronomy Precinct." The proposed project would disturb approximately nine acres within the 83,900-acre landmark, and could adversely affect the biota and visual resources of the site.

BUSSE FOREST

Cook County, Illinois
Ownership: County

The Busse Forest is one of the best remaining examples of mesic and dry-mesic upland forest in the eastern Central Lowlands biophysiographic province. The National Park Service sent a detailed letter regarding significance of this site and the expected environmental impacts that would occur with inundation in response to raising the height of a nearby dam.



BATTLE CREEK CYPRESS SWAMP

Calvert County, Maryland
Ownership: Private

Battle Creek Cypress Swamp was designated a NNL in 1965, and is significant for its wide variety of flora and fauna, its excellent condition, and the fact that there are very few cypress swamps at this latitude. The site's condition has been preserved because of its remote location and the natural character of its watershed, which may change if surrounding land is sold for development. The National Park Service sent letters supporting potential state acquisition of private property offered for sale within the watershed. Acquisition of the property by the state and allowing it to remain in its natural condition will help to protect water flow into the NNL.

WISSAHICKON VALLEY

Philadelphia County, Pennsylvania
Ownership: Municipal

Wissahickon Valley is a landmark located within Fairmount Park in Philadelphia. The valley was designated a NNL in 1964 as the type locality for Wissahickon Gneiss, and as a symbol of natural area preservation within a vast urban complex. This landmark was listed as a threatened site in the past because of erosion and sediment transport from poorly maintained trails. The National Park Service was pleased to send a letter in support of the Sustainable Trails Initiative – a proposal to rebuild 50 miles of natural surface trails within the park through a partnership between the Friends of Wissahickon and Fairmount Park. This work is expected to reduce erosion and improve overall water quality. Additional goals of the partnership are to improve stormwater management, restore habitat, and enhance visitor experience and safety.

Improving Conditions at Landmarks

CINDER CONE NATURAL AREA

San Bernardino County, California
Ownership: Federal (National Park Service)

This landmark contains highly illustrative examples of volcanic features, including cinder cones and lava flows. It is located entirely within Mojave National Preserve, which was established in 1994.

This NNL was listed as damaged and/or threatened from 1977-1989, and continuously from 1993 to 2007. Prior to creation of the Preserve, most of the cinder cones were damaged by activities associated with cinder exploration and mining. Residual scars from this activity consist of bulldozed access roads, top-notches and base cuts. Access roads to cone summits commonly were cut into the slopes of cones in ascending spirals. Trenches 5 to 30 feet deep, incised into crater rims and slopes, also mar the profiles of some cones.

A restoration project was funded by the American Recovery and Reinvestment Act and is now complete. The project increases public safety and has restored (recontoured and revegetated) more than four acres of mining exploration roads, prospect pits, a stockpile area, and trenches within the landmark. Roads have been graded to blend into the original contour of the disturbed area, trenches and pits with dangerous high walls have been obliterated, material stockpiles have been eliminated and the areas graded, and disturbed areas have been revegetated.

POINT OF ARCHES

Clallam County, Washington
Ownership: Federal (National Park Service)

This 168-acre site within Olympic National Park is a relatively isolated pristine environmental gradient from rocky tidelands to climax upland vegetation. It is an outstanding exhibit of sea action sculpting a rocky shoreline, characterized by spectacular offshore rocks, stacks, tunnels, inlets and tide pools. The uplands adjacent to the headlands show evidence of past glaciation and are forested with hemlock, cedar and spruce.

The site was formerly listed as threatened by proposed mining, including vegetation removal, and marine pollution. Favorable court rulings regarding the ownership of sand and gravel have reduced the potential for mineral exploration and resource damage. This landmark is therefore being removed from the Damaged and Threatened section of the annual report, although the NPS will continue to monitor the situation.

Damaged and Threatened Landmarks

Hemlocks Natural Area

Woolly Adelgid Threatens Eastern Landmarks

The introduction and continuing spread of hemlock woolly and balsam woolly adelgids pose a widespread threat to the health and sustainability of hemlock and fir forest throughout their range in the Eastern U.S. Hemlock woolly adelgid *(Adelges tsugae)*, native to Asia and balsam woolly adelgid *(Adelges piceae)*, native to Europe were first reported in the Eastern U.S. during the early 1950's. Although the exact mechanism and timeframe for tree decline and death differ, the extraction of fluid and nutrients, and possible injection of toxin by both species of adelgid is compounded by the absence of any natural enemies and tree resistance. In addition, weakened trees are then more susceptible to native pests and environmental stressors. Both adelgids produce a covering of white wax threads and appear as white, woolly dots on the tree's surfaces.

Hemlock woolly adelgid (HWA) infestation of eastern and Carolina hemlocks has resulted in areas of extensive tree mortality and decline, most severely in Virginia, New Jersey, Pennsylvania and Connecticut. Balsam woolly adelgid (BWA) has killed vast stands of Fraser and balsam fir throughout much of these species' ranges in the East. The potential loss of hemlock and fir forest from these exotic insects is comparable to the chestnut blight and Dutch elm disease.

HWA has damaged and threatens National Natural Landmarks throughout the Eastern U.S. Two sites in central Pennsylvania, designated for old-growth hemlock stands are showing severe impacts from HWA infestation. Snyder-Middleswarth Natural Area, located in Snyder County within Bald Eagle State Forest is an outstanding example of a relict forest; and Hemlocks Natural Area, located in Perry County within Tuscarora State Forest contains virgin forest of hemlock-northern hardwood type (atypical in this oak-chestnut region). HWA was discovered in Pennsylvania in 1967 and is currently present in at least 49 counties. There is some good news, in that the exceptionally cold 2008-09 winter helped to reduce the spread of HWA, and there exists a small, healthy stand of what appear to be naturally resistant trees at Hemlocks Natural Area that is under study.

Also hard hit by HWA is the climax hemlock forest at Mianus River Gorge in Westchester County, New York. The privately owned site provides exceptional illustration of piedmont physiography and geomorphology, as it has remained relatively undisturbed from the time of discovery and early exploration. HWA was discovered in New York in 1985 and is currently present in at least 20 counties, largely in the southeastern portion of the state.

Canaan Valley

At Mount Mitchell State Park in Yancey County, North Carolina, the balsam woolly adelgid has caused a severe decline in the endemic Fraser fir. Some of the most extensive stands of Fraser fir in the country are found within this landmark, and it is now estimated that nearly 80% of the fir canopy has died. The death of mature trees has increased over the last 10 years and the entire ridge where the landmark is located has been affected. Fraser fir does not have a seed bank; if reproduction is not successful prior to the death of infested trees, this important species may be lost altogether from the high elevation Southern Appalachian biotic communities. BWA is known to be present in at least 10 western counties in North Carolina.

At Canaan Valley in Tucker County, West Virginia, infestation by both balsam woolly adelgid and the hemlock woolly adelgid is causing mortality of balsam fir and eastern hemlock trees, respectively. HWA is known to occur in 28 and BWA in 3 counties in West Virginia. In addition, beech bark disease is causing a decline in American beech trees. This site contains a diverse assemblage of relict northern boreal communities and wetlands that are seldom found in the eastern United States. Additional threats to the biotic resources at this site include land development and recreational activities.

Chemical methods for controlling HWA and BWA have been successfully employed, but are cost and staff prohibitive to maintain and repeat as is required to be effective. The best option for management in forest settings may be biological control, using natural enemies (predators and pathogens) from the native environments of HWA and BWA. Efforts to locate, evaluate, and establish natural enemies are ongoing. In the meantime, impacts from HWA and BWA are expected to spread and intensify. BWA is already known to occur in numerous counties in Washington and Oregon and has the potential to impact much of the western states. Current distribution and forest risk maps for both pests, as well as general information are available at http://www.fs.fed.us/ne/morgantown/4557/AFPE/links.html.

Snyder Middleswarth

Twenty Six Additional Landmarks Threatened by a Variety of Activities

The National Natural Landmarks (NNLs) listed below are noted as threatened or damaged. A threat to the NNL resources must be imminent to warrant a listing; for example, a major project that could affect NNL resources should be in the study stage, not merely an alternative in the discussion stage. The list is organized alphabetically by state. A description of each landmark and an overview of current threats and/or damage follow the landmark name, location, and ownership. The information provided is intentionally brief, and more details can be obtained from the National Park Service, if desired.

MOBILE-TENSAW RIVER BOTTOMLANDS

Baldwin, Mobile, and Washington Counties, Alabama
Ownership: Federal (Army Corps of Engineers), State (Division of Lands), and Private

This 185,000-acre wetland and bottomland forest is one of the most extensive and significant wetlands in the United States. Many different habitat types, ranging from floodplain forests and freshwater swamps, to open brackish marshes, support a wide variety of wildlife and plant species, including several rare and endangered species.

This NNL is threatened by agricultural, residential, commercial, and industrial development and expanded oil and gas activities. The southern half of the landmark's western boundary is lined with heavy industry, including a number of chemical plants and a coal-fired electrical generation plant. However, much of the remaining landmark acreage that has not been degraded is now being protected, as the State of Alabama now manages approximately 100,000 acres within the NNL boundary that has been purchased primarily by the Corps of Engineers. A Forest Legacy grant from the USDA Forest Service was used to purchase additional acreage.

NEWSOME SINKS KARST AREA

Morgan County, Alabama
Ownership: Private

The 1,700-acre site is a classic example of a karst valley. It is about 4 miles long, 400 feet deep, and contains more than 40 caves. Both ends of the drainage basin are higher in elevation than the valley floor, forcing water runoff to escape through subterranean passageways. Karst developments of this magnitude and quality are rare in the United States.

Logging has denuded some large areas of forested land, which increases erosion, runoff, and possible degradation of cave resources. Off-road vehicles have damaged understory vegetation. Some caves show evidence of vandalism.

BOGOSLOF ISLAND

Located in the Bering Sea, 25 miles north of Umnak Island, Alaska
Ownership: Federal (U.S. Fish and Wildlife Service)

The site is a remnant of three volcanic eruptions, a rookery for Steller sea lions, and nesting ground for over 50,000 seabirds, including murres, puffins, and the rare red-legged kittiwake. It is part of the Alaska Maritime National Wildlife Refuge and is the scene of continued active volcanism.

Steller sea lion populations west of 144 degrees continue to be listed as endangered. There are multiple possible causes for the decline and research continues on fisheries competition, predation, ecosystem wide changes and other factors. The National Marine Fisheries Service (NMFS) issues annual rules to disperse fishing effort over time and area to provide protection from potential competition for important Steller sea lion prey species in waters adjacent to rookeries and important haul outs. Steller sea lion populations east of 144 degrees, listed as threatened, are showing some stabilization and local improvement.

BIG LAKE NATURAL AREA

Mississippi County, Arkansas
Ownership: Federal (U.S. Fish and Wildlife Service)

Big Lake National Wildlife Refuge is the only large area remaining in northeast Arkansas containing a significant amount of virgin bottomland hardwood timber. There is a mix of southern, Ozark, and Midwestern flora. The site supports several threatened or endangered species including the federally listed fat pocketbook mussel. The site is listed as a Globally Important Bird Area by the American Bird Conservancy.

The landmark receives enormous amounts of silt every year due to land clearing, agricultural land practices, digging of drainage ditches, and construction of dams. The silt is filling the lake, which impairs the growth of aquatic vegetation needed for fish and wildlife resources. The situation results in accelerated succession in the lake and tree mortality, especially oaks. There has been a dramatic loss of habitat quality and quantity. In addition, large amounts of trash and debris are carried into the NNL, although the site now has facilities in place to prevent trash and debris from entering the lake. Another threat is chemical contamination from agricultural applications in the watershed. There is also some chemical dumping into the canals, which is washed into the landmark.

SAN FELIPE CREEK

Imperial County, California
Ownership: Federal (Bureau of Land Management) and Private

The site represents one of the best examples of a natural desert stream and associated aquatic ecosystem remaining in the Colorado Desert. Extensive marshes occur along the stream channels, where rushes dominate along with tamarisk, arrowweed, atriplex, and mesquite. Aquatic snails, frogs, and a large population of pupfish inhabit the stream environment, while numerous birds and various mammals, such as coyotes and raccoons, frequent the site.

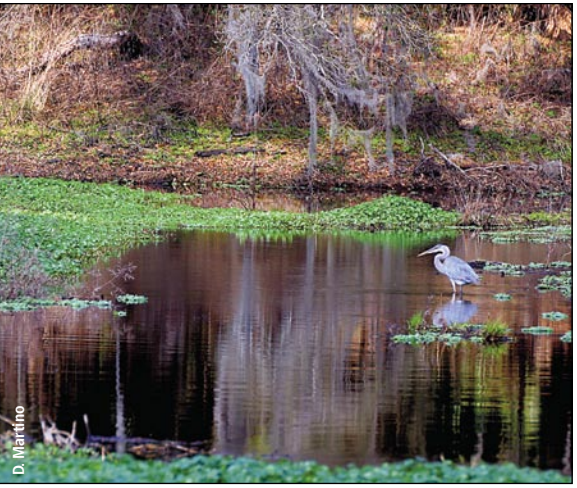
The site is threatened by groundwater pumping, increased agricultural land use, exotic species, and off-road vehicle use. Resource impacts include reduced water supply to creeks, degradation of water quality, increased nutrient levels and herbicide contamination, and damage to or displacement of native vegetation. The area continues to be used as a route for illegal aliens and drug smugglers, and subsequent pursuit by Border Patrol agents. The Border Patrol continues dragging tire-arrays along dirt roads to create a fresh surface for detecting recent traffic, but greater care is taken to avoid resource impacts than was the case in the past.

TIJUANA RIVER ESTUARY

San Diego County, California
Ownership: Federal (Navy, U.S. Fish and Wildlife Service), State (Department of Parks and Recreation), San Diego County and City, and Private

The Tijuana River Estuary is located between Imperial Beach, California, and the U.S.-Mexico international boundary. The site is part of a National Estuarine Research Reserve (NERR) administered by NOAA. Four biotic communities occur within the reserve: salt marsh, riparian, coastal sage scrub, and sand dune. Seven species of endangered birds, five of which are federally listed, seasonally reside or nest within the reserve. One federally listed endangered plant is also found within the reserve.

Threats to NNL resources stem from foot and vehicle traffic, development and associated erosion, road-building for Border Patrol law enforcement, and border fence construction. Resource impacts include degradation of water quality, trampling of vegetation, and increased sediment in the river and wetlands. Pollution and garbage remain an international cross-border problem; tires, non-biodegradable plastics and other materials have accumulated in marshes along the river channel. The International Wastewater Treatment Plant has reduced sewage input into the estuary but its capacity is exceeded during rainfall in excess of one-quarter inch. At such times, the waste treatment plant is bypassed and effluent is discharged directly into the estuary.


D. Martino

PAYNES PRAIRIE

Alachua County, Florida
Ownership: State (Department of Environmental Protection) and Private

This NNL contains the largest and most diverse freshwater marsh or wet "prairie" in northern Florida. The area is further characterized by karst topography and contains the Alachua Sink, one of the largest and most significant sinkholes in Florida. Disturbed live oak hammock forest, interspersed with a diversity of other species, surrounds the prairie on nearly all sides. The site is a major inland wintering ground for waterfowl in the Florida Peninsula and provides habitat for numerous other wildlife species, including the American alligator and southern bald eagle.

Threats to the site are primarily due to urbanization, and include stormwater and wastewater effluent discharge. Invasion by exotic species and successional changes in vegetation are on-going, with vegetation generally shifting from freshwater marsh species to woody herbaceous shrubs in various portions of the site.


T.M. Hardig

EBENEZER CREEK SWAMP

Effingham County, Georgia
Ownership: Private (multiple owners)

This 1,350-acre NNL occupies the floodplain of Ebenezer Creek, a tributary of the Savannah River. It has been noted as the best remaining cypress-gum swamp forest in the Savannah River basin. Old growth bald cypress and tupelo gum are common in this natural and relatively undeveloped area.

The site has been damaged by logging, and threats to water quality stem from watershed development, regulation of water levels in the Savannah River, and runoff from developed land that contains wastewater, soil, and high levels of nutrients. There has been an irreplaceable loss of cypress trees, and the swamp is exhibiting typical signs of eutrophication (nutrient enrichment), such as fish kills and excessive blooms of aquatic weeds.


S. Ringsven

MAUNA KEA

Island of Hawaii
Ownership: State

Mauna Kea is an exposed portion of the highest insular mountain in the United States and is the most majestic expression of shield volcanism in the Hawaiian Archipelago, if not the world. Also present is the highest lake in the U.S. and evidence of glaciation above the 11,000-foot level.

Mauna Kea is threatened by the proposed construction of the Thirty Meter Telescope Observatory within the upper

summit area of the landmark that lies within the 530-acre "Astronomy Precinct." The proposed project would disturb approximately nine acres within the 83,900-acre landmark, and could adversely affect the biota and visual resources of the site.

BUSSE FOREST NATURE PRESERVE

Cook County, Illinois
Ownership: County (Cook County Forest Preserve District)

This NNL contains one of the best remaining examples of mesic and dry-mesic upland forest in the Eastern Central Lowlands. Natural communities include dry-mesic upland forest, mesic upland forest, flatwoods shrub swamp, and marsh. The highest quality stand has been protected for so long that evidence of past logging has disappeared from most of the site, and part of the forest shows no evidence of past grazing. Such a large tract of high quality forest is very rare for this urbanized region of the country.

The site is threatened by a proposed dam modification (height increase) that would affect two-thirds to three-quarters of the site. Vegetation loss would include overstory trees, understory plants, and eliminate the soil seed bank, thereby affecting annual regeneration. These losses would reduce habitat for small mammals, forest and marsh birds, and insects. Changes in soil chemistry would include decreased oxygen availability and decomposition rates. DuPage County, located downstream of Busse Forest in Cook County, favors raising the height of the dam. This proposal was considered once before in the 1980s and 1990s, and was rejected, and it appears to be stalled at this time.

ILLINOIS BEACH NATURE PRESERVE

Lake County, Illinois
Ownership: State (Department of Natural Resources)

This NNL is part of Illinois Beach State Park, located on the shoreline of Lake Michigan near the Illinois/Wisconsin state line. The site consists of a series of numerous Holocene beach ridges parallel to the modern beach. There are 14 community types present, including sand prairie, sand savanna, beach, foredune, lake, pond, creek, seep, panne, marsh, sedge meadow, and forest communities. Over 60 species of animals and plants on the Illinois preliminary list of endangered and threatened species are known from Illinois Beach. The site was ranked number one of over 1,000 natural areas identified by the Illinois Natural Areas Inventory on the basis of its lack of disturbance, large size, diversity of habitats, and presence of endangered and threatened species.

The site is threatened by marina construction north of the park, which has cut off the natural process of sand replenishment and is contributing to shoreline erosion. Hydrological changes appear to be causing species changes, and exotic species are replacing native species.

Illinois DNR

LOWER CACHE RIVER SWAMP

Johnson and Pulaski Counties, Illinois
Ownership: State (Department of Natural Resources) and Private

This 1,250-acre tract of wet forest and swamp is 1/4 to 1/2 mile wide and extends for 5 miles along the Lower Cache River, which occupies an underfit stream valley carved by glacial outwash drainage. The tract lies at the northern range edge of many southern plants and animals and contains many large trees. No comparable area of large cypress and water tupelo is known in Indiana, Kentucky, Missouri, Arkansas, or Tennessee.

The site is threatened by diversion and channelization of the major tributaries emptying into the Lower Cache Swamp, which has made it a settling basin. Accelerated siltation is occurring, which in time will replace the swamp with dry land and change the species composition/structure of the high quality natural communities. There is a movement to restore flow between the Upper and Lower Cache Rivers, but this will take many years to achieve.

VOLO BOG NATURE PRESERVE

Lake County, Illinois
Ownership: State (Department of Natural Resources)

Volo Bog is a classic northern quaking bog. It has the characteristics of northern bogs near the southern limit of their occurrence. An area of open water is located at the center surrounded by cattails and giant bur-reed. The sphagnum mat is well developed and extends back from the open water some distance where it forms the substrate for the surrounding tamaracks and shrubs, such as poison sumac and winterberry. Because few bogs occur in Illinois, this site contains many plants that are unusual or rare in the state.

The site is threatened by an invasion of exotic plant species, including purple loosestrife, reed canary grass, and European buckthorn, which alter the native species composition. The McHenry dam keeps the regional water levels high and prevents natural drainage of the site. Two large parcels of land were purchased in 2009 to provide a buffer along the site and reduce encroachment from nearby development.

WAUCONDA BOG NATURE PRESERVE

Lake County, Illinois
Ownership: County (Lake County Forest Preserve District)

Wauconda Bog is actually a fen (due to almost neutral to alkaline pH) in very good condition. It occurs near the southern limits of bog or fen vegetation in Illinois, and represents an unusual biotic community for the region. The site represents a fen community in a mature state and has no open water. It illustrates bog succession, and is a mixture of trees, shrubs, and herbaceous plants.

Four invasive exotic plants have invaded the site: purple loosestrife, glossy buckthorn, reed canary grass, and

hybrid cattail, and the entire NNL is surrounded by single-family homes. A 1997 Illinois State Water Survey reported that lawn chemical runoff and septic systems pose moderate to high potential for contaminating surface waters, and that culverts and roads may contribute contaminants to ground water. Funding received via the American Recovery and Reinvestment Act of 2009 will support a restoration project lasting approximately two years and is expected to improve conditions at this site.

BELT WOODS

Prince George's County, Maryland
Ownership: State (Department of Natural Resources)

The site is one of the few remaining mature upland forests occurring in the Atlantic Coastal Plain physiographic province. Tulip poplar and white oak dominate this 43-acre site. Dominant trees average over two feet in diameter at breast height (dbh) and some are as large as 4.5 feet dbh. Of particular interest is the virtual absence of beech on the tract. Understory species include flowering dogwood, spicebush, sweet-haw, and ironwood. An unusually high number of bird species are found here. The site is located within 15 miles of downtown Washington, D.C.

A master plan by the Prince George's County Department of Public Works and Transportation (DPW&T) includes widening Church Road, which is adjacent to the east side of Belt Woods, from two to four lanes. The project would remove a 150 foot swath of trees within the NNL and expose sensitive interior tree and plant species, thereby altering the microclimate of the interior forest and jeopardize its continued use by Neotropical migratory birds.

TOBICO MARSH

Michigan DNR

Bay County, Michigan
Ownership: State (Department of Natural Resources)

This 956-acre NNL is located west of the barrier sand beach along Lake Huron's Saginaw Bay Shoreline. It is a relatively undisturbed area with three distinct habitats: a wide expanse of open water, marshland, and a mixed hardwood forest. It exhibits an excellent balance between open water and marsh vegetation, good variety of aquatic plant species, lack of disturbance, and is used by large numbers of migrating waterfowl. These qualities, combined with its size, make it one of the finest freshwater marshes in this part of the country.

Threats to the site include numerous influences on marsh water levels, a nearby hazardous materials landfill, and exotic species. Resource impacts include water quality/quantity and ecosystem impacts from manipulation of the water level.

BIG OAK TREE

Mississippi County, Missouri
Ownership: State (Department of Natural Resources)

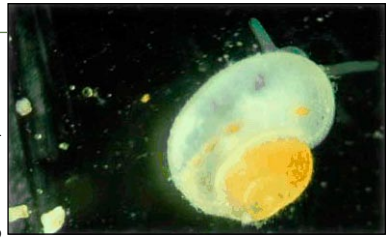
The site is the only sizeable tract of essentially uncut wet-mesic bottomland hardwood forest remaining in the northern part of the Missouri Alluvial Plain section of the Gulf Coastal Plain. Nearly the entire 1,026-acre park is native wetland, and represents one of Missouri's most threatened natural history features. The 80-acre NNL contains over 100 trees greater than 4 feet diameter at breast-height (dbh), including bur oak, overcup oak, swamp chestnut oak, shell bark hickory, and others. The park provides habitat for 200 native plant, bird, mammal, fish, and herptile species.

The site is threatened by the installation of ditches, pumps, and a levee installed to increase agricultural production, and by pesticides applied to crops. Resource impacts include shifting forest composition, loss of hardwood regeneration, and reduced species abundance and diversity.

Bill Gee

TUMBLING CREEK CAVE

Taney County, Missouri
Ownership: Private



The endangered Tumbling Creek Cavesnail

Tumbling Creek Cave has great physical diversity, including highly decorated passages with cave formations such as stalactites, soda straws, stalagmites, columns, flowstone, rimstone dams, draperies, and cave coral. The cave contains the most diverse fauna known for any cave in the United States west of the Mississippi River. In addition to providing habitat for a colony of 150,000 gray bats, a federally listed endangered species, fauna include several species which appear to be unique to this cave system, and others that are on State and Federal rare, threatened, and endangered species lists.

Cave resources are threatened by conversion of timber land to pasture, grazing, and burning within the cave's recharge area. Approximately 45% of this area has been converted from timberland to pasture; much of this area is steep and has been heavily grazed. Erosion from the cleared land has resulted in siltation of the cave's stream and reduced water quality. These changes may be responsible for a decline in the Tumbling Creek Snail population, which is a monotypic genus known only from this cave.

SNAKE BUTTE

Jackson County, South Dakota
Ownership: Indian Trust (Oglala Sioux Tribe)

Snake Butte is of great geologic value due to sand calcite crystals that have formed on the undersides of the overhanging ledges of the butte. It is one of the two known locations for sand calcite crystals in the world. Upon exposure to weather the crystals lose their sharp angles and become rounded due to softness. The site is also significant for vertebrate fossils.

The site is threatened by theft of the resources, which are then sold. Blocks of rock that support ledges are showing signs of collapse, and ledges in the main quarry area have been cut back significantly. Remaining crystals have been damaged by tools that are used in the collection process.

REELFOOT LAKE

Lake and Obion Counties, Tennessee
Ownership: Federal (U.S. Fish and Wildlife Service), and State (Wildlife Resources Agency and Department of Conservation)

The site is comprised of 23,000 acres of cypress swamps, sawgrass jungle, water lily glades, and scattered bodies of open water. The landscape was formed in 1811-12 by the action of the New Madrid earthquake, the most severe recorded in the United States. Over an area of some 30,000-50,000 square miles, intensive shocks resulted in domes and sunken lands, fissures, sinks, sand blowouts, and large landslides. The sinking of a large area and temporary damming of the Mississippi River tributaries formed the lake.

The site is threatened by silt accumulation and the construction of levees, and other flood control and drainage improvements along the Mississippi River that have altered the seasonal flooding regime. Resource impacts include loss of recreational waters and waterfowl habitat, loss of fisheries and aquatic habitat, aquatic plant growth, and changes in pH levels. A new spillway is expected to help improve conditions at the lake in years to come.

SANTA ANA NATIONAL WILDLIFE REFUGE

Hidalgo County, Texas
Ownership: Federal (U.S. Fish and Wildlife Service)

This 2,088-acre NNL is located on the U.S.-Mexico border in a bend of the Rio Grande River. The site is an excellent example of mid-valley riparian forest that has largely disappeared from the lower Rio Grande Valley. Woodland, brushy areas, lakes, and ponds provide habitat for nearly 300 butterfly species, and 400 species of birds, including a number of Mexican bird species at their extreme northern limit. The mammal population includes ocelot and jaguarundi, which are federally listed endangered species. Over 450 species of plants grow on the refuge, many of which are endemic to the region.

Dam construction has effectively eliminated the natural flooding regime, causing a habitat conversion from flood forests to thorn scrub. Water is less available to recharge wetlands, forests, and groundwater, and the water table is dropping. Siltation, an aspect of natural flooding that replenishes nutrients in the soil, has also been eliminated and salt buildup is occurring. Rare plant species, especially the larger trees, are dying and slowly being replaced by species more adapted to xeric (dry) conditions. The refuge also supports rare wildlife species, which are threatened by the habitat conversion.

SALT RIVER BAY

St. Croix, U.S. Virgin Islands
Ownership: Federal (National Park Service) and Private

This 690-acre site contains Salt River Bay, including Sugar Bay and Triton Bay tributaries. Together the bays encompass a variety of tropical marine and terrestrial ecosystems. It includes mature mangrove forests and one of the last remaining stands of the large swamp fern. The area contains a high-energy tropical reef system. The submarine canyon at the mouth of Salt River Bay provides habitat for deep-water corals, sponges, and fishes.

The site is threatened by activities associated with a marina and by the invasion of exotic plant species. Resource impacts include degradation of water quality and alteration of native species composition.

JOSHUA TREE NATURAL AREA

Washington County, Utah
Ownership: Federal (Bureau of Land Management)

This 1,052-acre site is the northernmost stand of yucca trees in the United States and the only Joshua tree forest in Utah. Its occurrence is due to the well drained sands and gravels from coarse soils around slabs of protruding Mississippian limestone. Other plants thriving on the exposed limestone that reach the northern edge of their range include the Utah agave, barrel cactus and cottontop cactus. Animals at this site are mostly of the Mojave Desert affinity, with the desert tortoise, cactus wren, Scott's oriole and kit fox reaching the northern edge of their range.

Two fires have gone through this site since 2004 causing extensive mortality of Joshua trees; very few of the Joshua trees were left unburned. The Joshua Tree Association is not a fire-resistant system and the sparse vegetation and bare soil normally wouldn't carry a fire. However, recent invasion of exotic grasses, primarily cheatgrass, has created a non-natural fuel load capable of carrying fire across great distances. While some of the burned Joshua trees have begun to sprout, there is still very little regeneration.

This NNL lies within the newly established Beaver Dam Wash National Conservation Area. This new designation brings funding for new positions within the BLM office for this area and withdraws the site from mining. The NNL may also benefit from the establishment of the Mojave Desert Initiative – a multi-agency, multi-state initiative focused on protecting and restoring key habitats and corridors within this ecoregion.

MOLLY BOG

Lamoille County, Vermont
Ownership: State (University of Vermont) and Private

Molly Bog illustrates a classic, early successional, cold northern bog. The site contains a small, dark-water pond, floating mat of sphagnum moss and heath plants, and black spruce-tamarack forest. The pond and directly adjacent bog are owned and well managed by the University of Vermont (UVM) as one of its Natural Areas. UVM owns only a narrow buffer around the pond and bog proper, putting the core of the site quite close to privately owned lands.

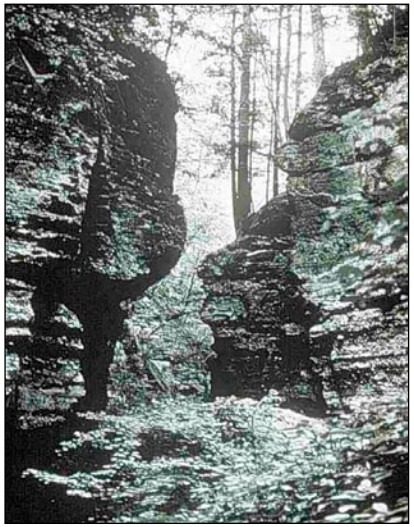
Activities on lands within and adjacent to the NNL pose a threat to the bog. Most recently, a sizable portion of land has been clear-cut and is on the market for sale, facing the potential further threat of development. In addition, ongoing land use activities, such as tree farming continue to encroach on the bog and pond.

VIRGINIA COAST RESERVE

Accomack and Northampton Counties, Virginia
Ownership: Private (The Nature Conservancy)

This 35,000-acre site consists of a mosaic of 14 barrier islands, saltmarsh, lagoons, and mudflats, all in relatively undisturbed condition. It comprises the majority of the barrier island system of Virginia and contains an excellent representation of all the various vegetative communities once occurring on many barrier islands from North Carolina to New Jersey before human settlement.

Land development on the lower eastern shore is affecting the site through direct destruction or conversion of habitat, degradation of water quality, and alteration of surface and groundwater hydrology. Offshore sand dredging is a new threat noted in 2009. Invasive and/or non-native plants, particularly *Phragmites australis*, are causing a precipitous decline of native flora. Extraction of marine resources (dredge fishing, clamming and clam farming, oyster harvesting, etc.) and the release of exotic organisms are leading to excessive resource depletion and the disruption of food web resources. The lagoon salt marshes continue to decline in the area as marsh sedimentation is not keeping up with sea-level rise. Native and introduced mammalian predators are impacting productivity and reducing nesting island birds.



BARABOO RANGE

Sauk County, Wisconsin
Ownership: State (Department of Natural Resources) and Private

This 50,000-acre site is exhumed Precambrian basement rock, surrounded by a plain developed on Paleozoic strata. The Green Bay Lobe of the Wisconsin Stage of the Pleistocene glaciation has glaciated eastern portions of the area. The differences in elevation, exposure, and soils create a variety of habitats, including high, dry rock strata where white pine predominates; rocky cliffs covered with lichens and mosses; cool steep valleys and ravines with hemlock; dry and wet prairie; and marshes. Approximately 1,096 of the more than 2,200 vascular plants noted in Wisconsin have been found in this tiny fraction of the state.

The NNL is threatened by increasing land development, recreational impacts, highway construction, quarrying, logging, and discharge from septic systems. Affected resources include water and soils, and the entire landmark ecosystem.

For more information please visit our web site at:

www.nature.nps.gov/nnl

Information provided on the NNL Program web pages includes a guide to landmarks by state, frequently asked questions, the regulations that govern the program, including the designation process, and contact information for NNL Program staff. There may also be links to the web sites of landmarks that are open to the public, NNL Program publications, articles on landmarks by others, and photographs of landmark resources.

National Natural Landmarks Program

Supporting Conservation of America's Natural Heritage